JPRS 76275

22 August 1980

Worldwide Report

NUCLEAR DEVELOPMENT AND PROLIFERATION

No. 58

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NUCLEAR SCIENCE CONFERENCES SCHEDULED FOR SEPTEMBER-NOVEMBER 1980

Rome NOTIZIARIO COMITATO NAZIONALE PER L'ENERGIA NUCLEARE in Italian May 80 pp 97-98

[Excerpt]

1-5 September	Heidelberg, West Germany	International Symposium on the Use of Radionuclides in Medicine	Mr. Robert Najar, Conference Service Section, IAEA, PO Box 590, A-1011 Vienna, Austria
2-5 September	Pisa, Italy	12th Conference of the European Group on Atomic Spectroscopy (EGAS)	Mr. A. Gozzini Istituto di Fisica, Universita di Pisa, Piazza Torricelli, 2 56100 Pisa, Italy
3-5 September	London, Great Britain	5th International Symposium on the Supply and Demand of Uranium and Pertinent Technical and Policy Problems	The Uranium Institute, 8th Floor, New Zealand House, Haymarket, London SWIY 4TE, UK
8-12 September	Munich, West Germany	11th World Energy Conference	Nationales Komittee der Weltenergiekonferenz fur die Bundesrepublik Deutschland, Graf-Recke-Str. 84, Postfach 1139, D-4000 Duesseldorf, West Germany

10-12 September	Paris, France	SEFI 1980: Training engineers in and for the society in which they live	Office: Comite d'Etudes sur les Formations, d'Ingenieurs, Madame Michelle Carre 4, Rue Cambon, 75001 Paris, France
14-17 September	Amsterdam, The Netherlands	International Conference on Fuel Cycle	Conference Office, Atomic Industrial Forum, Inc., Washington, DC 20014, U.S.A.
15-19 September	Vienna, Austria	International Symposium on Isotopes in Geochemistry, Geochronology, and Cosmochemistry	Mr. Robert Najar, Conference Service Section, IAEA, P.O. Box 590, A-1011 Vienna, Austria
23-27 September	Amsterdam, The Netherlands	7th International Symposium on Fresh Water from the Sea	Working Party on Fresh Water From the Sea, Tsaldari 34, Amaroussion, Greece
6-9 October	St. Petersburg, Florida, U.S.A.	Conference on Materials for Nuclear Steam Generation	Mr. Richard T. Begley, Manager, Nuclear Steam Generation Engineering and Nuclear Equipment Divisions, Westinghouse, P.O. Box 855, Pittsburgh, PA 15230, U.S.A.
6-10 October	Vienna, Austria	International Symposium on the Storage of Radioactive Residues in a Marine Environment	Mr. Robert Najar, Conference Service Section, IAEA, P.O. Box 590, A-1011, Vienna, Austria

20–24 October	Stockholm, Sweden	International Conference on Problems of Nuclear Plant Safety	Mr. Robert Najar, Conference Service Section, IAEA, P.O. Box 100, A-1400 Vienna, Austria
27–31 October	Paris, France	International Symposium on Dosimetry in Biology and Medicine: Physical Aspects, Instrumentation, Calibration	Mr. Robert Najar, Conference Service Section, IAEA, P.O. Box 590, A-1011 Vienna, Austria
10–14 November	Berlin, West Germany	6th International Symposium on Packing and Transportation of Radioactive Materials (PATRAM 80)	Congress Organisation Company (GOC), Kongress-Zentrale, John-Foster-Dulles-Allee 10, D-1000 Berlin 21 (West Germany)
16–21 November	Washington, D.C. (U.S.A.)	Joint Meeting of the American Nuclear Society and the Atomic Industrial Forum	Mr. Angelo Giambusso, Stone and Webster Engr. 7315 Wisconsin Avenue, Bethesda, MD 20014, U.S.A.
16–21 November	Boston, Mass., U.S.A.	3rd International Symposium on Scientific Foundations for Handling Nuclear Industry Waste	Mr. J.G. Moore, Bldg. 9204-3, Oak Ridge National Laboratory, P.O. Box Y, Oak Ridge, TN 37830, U.S.A.
18–20 November	Saint-Vincent, Italy	2nd International Meeting on Energy: Nuclear and Coal Energy Toward the Year 2000	Organizing Committee: Relations Italia International Marketing Division, Via Monte Rosa, 19 20149 Milano (Italy)

24-28 November	Colombo, Ceylon [Sri Lanka]	International Symposium on Combined Processes in Food Irradiation	Mr. Robert Najar, Conference Service Section, IAEA, P.O. Box 100, A-1400 Vienna, Austria

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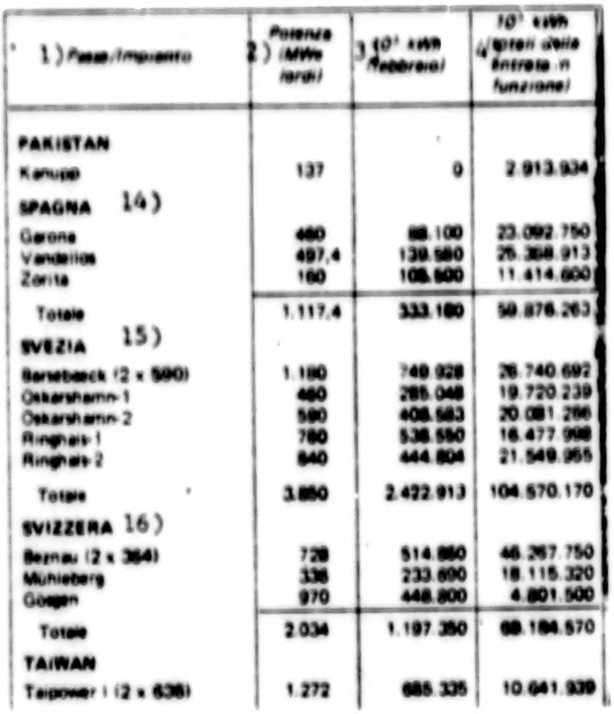
MONTHLY REPORT ON WORLDWIDE NUCLEAR ENERGY PRODUCTION

Rome NOTIZIARIO COMITATO NAZIONALE PER L'ENERGIA NUCLEARE in Italian May 80 pp 30-31

[Table prepared by Elga Borri: "Worldwide Nuclear Electric Energy Output"]

[Excerpt]

1) Paese/Impianto	Potenza 2) MWe lordi	3) 10³ kWh (febbraio)	4) 10³ kWh (totali dalla entrata in funzione)
ARGENTINA			
Atucha	357	126.039	13.739.339
BELGIO 5)			
Doel (2 x 412)	824	579.800	27.383.080
Tihange-1	920	431.000	27.418.390
Totale 6)	1.744	1.010.800	54.801.470
CANADA			
Bruce (4 x 800)	3.200	1.973.100	49.096.230
Douglas Point	220	40.340	11.658.677
Pickering (4 x 542)	2.168	1.462.190	119.198.120
Totale	5.588	3.475.630	179.953.027
COREA DEL SUD 7)			
Kori-1	587	673	5.658.899
FINLANDIA 8)			
Loviisa-1	465	323.872	9.614.288
Olkiluoto-1	683	440.974	4.607.725
Totale	1.148	764.846	14.222.013
FRANCIA 9)			
Bugey-1	555	372.380	23.238.480
Bugey (4 x 957)	3.828	2.484.750	19.835.780
Chinon-2	240	135.838	18.902.393
Chinon-3	415	239.584	20.402.445
Chooz (Sena)	325	213.000	20.198.000
Fessenheim (2 x 930)	1.860	1.283.940	25.410.822
Marcoule *	43	28.888	10.689.037
Monts d'Arrée	75	51.747	4.655.824
Phénix	250	171.310	7.287.540
St. Laurent-des-Eaux-1	475	17.006	28.470.618
St. Laurent-des-Eaux-2	530	327.770	28.315.264
Totale	8.596	5.324.231	208.382.203
GERMANIA OCC. 10)			
Biblis A	1.200	447.115	37.084.650
Biblis B	1.300	457.680	22.929.074
Brunsbüttel	806	0	6.989.380
MZFR	57	39.703	4.213.056
Neckar	855	586.164	17.500.107
Obrigheim	345	235.680	27.088.610
Ohu	900	453.988	9.068.337
Stade-1	662	488.112	38.310.280
Unterweser	1.300	912.830	11.340.088
Würgassen	670	388.682	17.772.308
Totale	8.095	3.968.635	183.282.849
GIAPPONE 11)			
Fugen	165	228	1.408.478
Fukushima-1	460	0	14.288.244
Fukushima (4 x 784)	3.136	1.224.984	54.564.975
Fukushima-6	1.100	780.100	4.935.040
Genkai	559	388.916	16.688.908
Hamaoka-1	540	1.534	10.444.382
Hamaoka-2	840	499.632	8.455.599
Ikata	566	393.003	9.343.970
Mihama-1	340	17.077	5.610.117
Mihama-2	500	247.083	16.558.134
Mihama-3	826	566.662	14.798.107
Ohi (2 x 1175)	2.350	808.480	12.506.682
Shimane	460	318.232	17.337.501
Takahama (2 x 826)	1.652	1.111.378	36.940.108
Tokai-1	166	85.370	12.853.065
Tokai-2	1.100	731.665	10.687.060
Tsuruga	357	226.439	19.378.316
Totale	15.117	7.378.771	266.774.684
GRAN BRETAGNA 12)			
Berkeley (2 unità)	334,4	189.000	38.691.000
Bradwell (2 unità)	374,1	50.000	37.014.000
Calder Hall (4 unità)	240	119.081	35.112.455
Chapelcross (4 unità)	240	160.267	35.154.703
Dounreay PFR	250	0	810.760
Dungeness A (2 unità)	576,6	0	45.371.000
Hinkley Point A (2 unità)	663,9	310.000	49.714.000
Hinkley Point B (2 unità)	1.320	376.000	13.807.000
Hunterston A (2 x 169)	338	206.123	39.241.236
Hunterston B (2 x 660)	1.320	313.090	10.212.110
Oldbury (2 unità)	633,5	307.000	35.269.000
Sizewell (2 unità)	652,5	309.000	50.201.000
Trawsfynydd (2 unità)	584,8	302.000	48.850.000
Windscale AGR	32	16.970	3.451.862
Winfrith SGHWR	100	71.473	5.768.307
Wylfa (2 unità)	1.352	680.000	38.279.000
Totale	9.011,8	3.380.004	484.945.433
INDIA			
Rapp-1	220	23.638	4.636.084
Tarapur (2 x 200)	400	83.484	19.682.8[illegible]
Totale	620	107.122	24.318.966
OLANDA 13)			
Borssele-1	475,5	328.680	20.791.055
Dodewaard	54	36.240	4.231.786
Totale	529,5	364.920	25.022.841

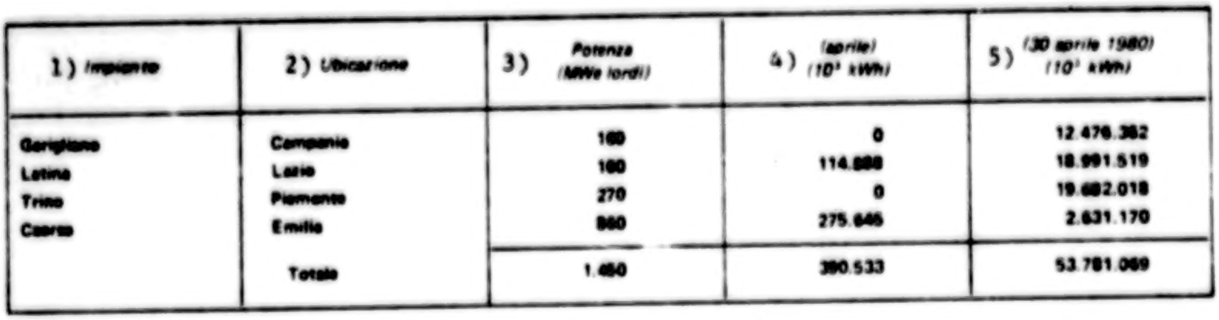


1) *Paese/Impianto*	2) *Potenza (MWe lordi)*	3) *(10³ kWh Febbraio)*	4) *10³ kWh (totali dalla Entrata in funzione)*
PAKISTAN			
Kanupp	137	0	2.913.934
SPAGNA 14)			
Garona	460	88.100	23.092.750
Vandellos	497,4	139.580	25.368.913
Zorita	160	105.500	11.414.600
Totale	1.117,4	333.180	59.876.263
SVEZIA 15)			
Barsebaeck (2 x 590)	1.180	740.928	26.740.692
Oskarshamn-1	460	285.048	19.720.239
Oskarshamn-2	580	408.583	20.081.286
Ringhals-1	790	538.550	18.477.998
Ringhals-2	840	444.804	21.549.955
Totale	3.850	2.422.913	104.570.170
SVIZZERA 16)			
Beznau (2 x 364)	728	514.860	46.267.750
Mühleberg	336	233.690	18.115.320
Gösgen	970	448.800	4.801.500
Totale	2.034	1.197.350	69.184.570
TAIWAN			
Taipower I (2 x 636)	1.272	685.335	10.641.939

Key:
1. Country/plant
2. Capacity (gross MTU)
3. February
4. Totals, as of entry into operation
5. Belgium
6. Total
7. South Korea
8. Finland
9. France
10. West Germany
11. Japan
12. Great Britain
13. Holland
14. Spain
15. Sweden
16. Switzerland

unita - units

Nuclear Electric Energy Output in Italy



1) *Impianto*	2) *Ubicazione*	3) *Potenza (MWe lordi)*	4) *(aprile) (10³ kWh)*	5) *(30 aprile 1980) (10³ kWh)*
Garigliano	Campania	160	0	12.476.382
Latina	Lazio	160	114.888	18.991.519
Trino	Piemonte	270	0	19.682.018
Caorso	Emilia	860	275.645	2.631.170
	Totale	1.450	390.533	53.781.089

Key:
1. plant
2. location
3. capacity (gross MTU)
4. April
5. 308.1980

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MONTHLY REVIEW OF WORLDWIDE NUCLEAR ENERGY DEVELOPMENTS

Rome NOTIZIARIO COMITATO NAZIONALE PER L'ENERGIA NUCLEARE in Italian
May 80 pp 17-28

[Excerpts] The news reported here refers to the status as of 15 May 1980.

Italy

CIPE [Interministerial Committee for Economic Planning] approves guidelines for Fourth Five-Year Plan of CNEN [National Nuclear Energy Center].

Conference on "The Nuclear Risk," organized by the Friends of the Earth, Rome, 16-17 May 1980.

Agreement between Fabbricazioni Nucleari and General Electric.

Seminar at CNEN on Fifth IRPA Congress in Jerusalem.

CNEN-AGIP [National Italian Oil Company]-Nuclear establish Nucleco.

Credito Italiano of London loans AGIP Nuclear $75 million.

Program address by Premier Cossiga to both Houses.

Australia

Atomic Commission active regarding uranium in Northern Territory.

New company for research on large-scale ethanol production.

Belgium

Tihange 1 once again in operation.

Finland

TVO 2 in operation, Loviisa 1 at full capacity, plans for RBMK-1000.

France

Anticipation of 12-17 percent reduction in cost of electric energy in communities with nuclear power plants.

CEA [French Atomic Energy Commission] establishes the EPI-CEA Finance Company.

Uranium deposits exploited.

La Hague reprocessing plant.

West Germany

Electric energy output in 1979.

Letter of intention for KKI 2.

Third partial construction permit for Gundremmingen 2.

East Germany

Nord 4 in operation.

Agreement with USSR for construction of third nuclear power plant.

Japan

Uranium prospecting in United States.

Experimental Program for dumping nuclear waste into the ocean.

Great Britain

Confirmation of decision to build two AGR power plants at Heysham and Torness.

BNFL plans for possible increase in losses in Windscale silo.

Government authorizes shipment of plutonium from Windscale to Dounreay.

United States

Carter reorganizes NRC.

Onions dried with geothermal dehydrator.

Use of geothermal water to produce gasohol.

Experiments [illegible]

The [illegible]

Analysis of [illegible]

New methods of [illegible]

Plans for [illegible]

Uranium [illegible]

Review

Fuel charging [illegible]

USAF

BN-600 critical [illegible]

Information [illegible]

Data on safety [illegible] programmes in 1979

Production of [illegible]

International [illegible]

RBD

Financing [illegible]

ENS

European [illegible]

Annual [illegible]

Fuel supply [illegible]

International [illegible]

Classification [illegible] (OECD)

Other

CEC [illegible]

During the meeting on 29 April, CIPE approved the guidelines for the Fourth Five-Year Plan of the CNEN for the period of 1980-1984 (see documentation).

During that same meeting it also ratified the international agreements entered into by the CNEN and AGIP Nuclear within EURODIF.

EURODIF [European Diffusion Agency].

CNEN Seminar on the Fifth IRPA Congress at Jerusalem

The Fifth Congress of the IRPA (International Radiation Protection Association) was held in Jerusalem between 9 and 14 March 1980; it consists of the various national radiation protection companies on a worldwide level.

The topics taken up during the congress were covered in a seminar held in Rome at the headquarters of the CNEN on 5 May. These topics will be reported on in our subsequent news bulletins.

Agreement Between Fabbricazioni Nucleari and General Electric

A multiannual agreement was signed on 14 April at San Jose, California, by engineer Graziano Trivellato, vice president of AGIP Nuclear and president of Fabbricazioni Nucleari, and Mr Wolfe, vice president and general manager of the Nuclear Energy Programs Division, GE, and Mr Fields, assistant treasurer, GE. The agreement calls for the involvement of FN (Fabbricazioni Nucleari), a company controlled by AGIP Nuclear (ENI [National Hydrocarbons Agency] Group), in the production of nuclear fuel intended for boiler-water reactors designed by GE outside the Italian market.

As part of this general agreement, GE has given FN a first production order involving the supply of a quota of the fuel for the first charge at the Leibstadt, Switzerland, power plant, equipped with a BWR of 1,000 MWe by GE.

The purpose of this delivery is to produce complete fuel elements and includes other accessory services.

AGIP Nuclear has just signed an agreement with GE concerning the purchase--under market conditions--of mechanical components for fuel elements of the GE type which are not produced by Italian industry.

CNEN-AGIP Nuclear Establish Nucleco

During a meeting on 18 March, the board of directors of CNEN approved the establishment of Nucleco, a stock company between CNEN and AGIP Nuclear to handle low-activity radioactive waste.

Credito Italiano [illegible]

A loan agreement involving $15 million was signed recently in Brussels between Credito Italiano of London and [illegible]

The loan will run for 8 years and will be governed by a "spread" beyond the going rate [illegible] (in London), amounting to 0.50 percent for the first 2 years and 0.625 percent for the remaining 6 years. The amortization time will be 4-1/2 years.

A group of Italian and foreign banks cooperated in the transaction; the group was organized by [illegible], under the direction of Credito Italiano of London, the [illegible] Banking Institute of Turin, the Bank of Indochina and Suez, the Bank of Paris and the Netherlands, and the International Bank for West Africa.

Australia

Atomic Energy Commission [illegible] Northern Territory

The Australian Atomic Energy Commission [illegible] stock share of 10.7 percent in the uranium [illegible] Northern Territory.

The Ngalia Basin deposit contains [illegible] more than 330,000 t of mineral with an average content of [illegible]

The other stockholders in the [illegible] Australia Pty Ltd (Italy), Uranerzbergbau [illegible] (West Germany), and the Australian [illegible]

New Company to Study Large-Scale [illegible]

A new company--Australian Ethanol [illegible] Ltd--was established to study the possibility of developing a large ethanol industry in the country. The company will [illegible] to set up a plant in Sydney capable of producing 500,000 [illegible] obtained from wheat, to be mixed [illegible] to yield gasohol.

The plant might [illegible] in operation, the company will [illegible] demonstration plant capable of [illegible] million gallons of ethanol per year in 1983.

If the initial [illegible] will be built within 5 to 6 years, with a maximum [illegible] gallons.

This output [illegible] of Australia's liquid fuel requirements. [illegible] positions on this point so far. However, subsidies of about $2 million were given over the past 3 years for research on fuels and the ethanol used in the factories and [illegible] officials at the National Energy and Development Department underscored the need for having more economic data and figures relating to research available before the government would take further steps to encourage the production of ethanol).

Belgium

Tihange-1 Again in Operation

The Tihange power plant resumed operation on 3 March; it had been closed down on 20 February for safety reasons connected with a personnel strike.

Finland

TVO-2 in Operation, Loviisa-1 at Full Power, Plans for RBMK-1000

The electric energy, generated by the second unit at Olkiluoto, of Teollisuuden Voima Oy, was introduced into the network on 18 February.

The TVO-2 unit, like TVO-1, which produced energy for the first time on 2 September 1978, is equipped with a BWR from Asea Atom, a Swedish company, with 660 MWe net.

The reactor became critical for the first time last 13 October.

Furthermore, the first unit of the Loviisa power plant--which, from the time it became operational, in 1977, has been running at 92 percent of nominal power (440 MWe)--on 1 January received the go-ahead to reach full capacity. There are presently four nuclear power plants in operation in the country; they are Loviisa 1 and 2 and TVO 1 and 2, with a total of 2,260 MWe.

There is also a project relating to the construction of a 1,000-MWe power plant of the Soviet RBMK type. In this connection, the Finnish-Soviet study group for energy questions recently came out in favor of the construction of this project. The negotiations between these two government agencies--Imatran Voima and Atomenergoeksport, will be started shortly.

The project goes back to 1974, a time at which a preliminary accord had already been drafted along these lines between the two countries.

France

Anticipate 12-17 Percent Reduction in Electric Energy Cost in Communities with Nuclear Power Plants

According to a report published in the BULLETIN OFFICIEL DE SERVICES DES PRIX, on 2 April, a reduction will be made, by decree, in the electric power rate charged to users who live in communities near big nuclear electric power plants (at least 600 MWe).

Interested individuals will, until 1 January 1990, benefit from a reduction (excluding taxes) in the price of each kwh amounting to F 0.05 for low voltage (domestic uses) and F 0.03 for medium voltage (industrial and professional uses).

Since the average low-voltage kwh price at this time (excluding taxes) is F 0.28, the reduction thus will turn out to be about 17 percent. In the case of medium voltage, where the rate schedules vary according to the time of day, the average kwh price is F 0.25. The reduction here therefore is 12 percent.

CEA Establishes EFICEA Finance Company

With the intention of increasingly diversifying its activities and improving the knowledge acquired by its researchers, the CEA has established a new finance company, the EFICEA (Enterprise for the Promotion of Innovation in the CEA).

The CEA general administrator Michel Pecqueur said that he thinks and hopes that the new company, through participation in other industrial companies, will be able to improve the knowledge acquired in the following sectors: Electronics, robot engineering, chemical engineering, biology, energy savings, agriculture, etc., as well as possible other new techniques which are not now covered by the CEA.

The CEA does not intend to take the place of industrial enterprises but rather plans to furnish them with necessary assistance during the period of product, method, and material development. It received 30 percent of the stocks held by EFICEA whose initial share capital is F 10 million.

Uranium Deposit Exploitation

COGEMA [General Nuclear Materials Company] recently filed an application for the exploitation of uranium deposits in some communities in Var.

The application, which covers a period of 50 years, in particular involves the communities of Vidauban, Garde-Freinet, and Le Cannet des Maures, in the massif by the same name.

On the basis of initial studies conducted by COGEMA, the mineral reserves in the areas under consideration should be estimated at about 400,000 t and could be strip-mined since the mineral deposits have been identified in the surface and at a depth of 60 m.

La Hague Reprocessing Plant

The current nuclear fuel reprocessing capacity of the La Hague plant is about 50 percent below initial estimates.

This situation has been confirmed both by COGEMA officials and by the shop stewards of the CFDT [French Democratic Confederation of Labor] at the CEA, on the occasion of a debate organized by the AJSPI (Association of Scientific Journalists of the Information Press).

This involves the reprocessing capacity for oxide-containing fuels from the LWR reactors. Thus, the HAO (high-radioactivity oxide) equipment of the UP-2 plant is able to process only 200-250 t/yr instead of the anticipated 400.

COGEMA and CEA managers admitted that the investment for putting in the HAO equipment was underestimated; as a matter of fact, it will be closed down and a new UP-2 plant will be rebuilt with a capacity of 800 t/yr.

The above indicates that the reprocessing of irradiated fuels is not an easy technique in which however France presently occupies an outstanding position since it is practically the only country in the world to "reprocess" for foreign countries.

During the new program, the fourth one launched in November 1979 (see NOTIZIARIO, 25, 12, December 1979), the La Hague plant reprocessed 69 t of of spent fuel from the power plants at Muehleberg (Switzerland), Wuergassen and Gundremmingen (FRG), but in this case likewise, the service rendered was not extraordinary because that figure accounts for about half of the anticipated 110 t.

There have not been any major basic problems here. The first reprocessing campaign was carried out starting in the summer of 1979 for the core of the Phenix reactor and they are just about to start reprocessing of irradiated fuels coming from the French-Belgian power plant at Tihange.

The latter is an important event because it involves standard fuel which will be used in all of the French nuclear power plants currently under construction or already in operation, such as Fessenheim.

The first shipment coming from the latter power plant, consisting of 30 t of irradiated fuel, will be processed by the end of 1980.

The schedule for the construction of new reprocessing units at La Hague has not yet been spelled out but it will take 5 years to build one of them there.

On the other hand, it was learned that the tonnage of irradiated fuels coming from the power plants of the EDF [French Electric Power Company], will reveal the following figures: 80 t in 1980, 171 t in 1981; 216 t in 1982, 240 t in 1983, [illegible] t in 1984, and 800 t in 1985. To these figures we must add those which COGEMA will be able to reprocess for foreign countries, a figure whose total already exceeds 5,000 t.

To avoid problems of accumulation in the plants, new irradiated fuel storage pools will be built at La Hague.

The current 800 t pool is full, two more, of 2,000 t, each, will be built in 1981 and others will follow.

At 1979 prices, a 2,000-t pool will cost F 400 million and the 10-year storage cost for fuel is F 1,400/kg.

The reprocessing of 1 kg of irradiated fuel has been estimated at F 3,000/kg.

It was emphasized in the course of the debate that the average radiation doses received by personnel has been declining since 1975.

For CEA personnel, they dropped from 500 mrem to 215 mrem in 1979; for personnel of the subcontractor enterprises, the figures are, respectively, 597 and 232 mrem.

The annual permissible dose is 5 rem.

West Germany

Electric Energy Output in 1979

According to initial statistics provided by VDEW (Association of Electric Power Enterprises), electric power output in 1979 came to 295.6 TWh, exceeding the preceding year's output by 5.8 percent.

Specifically, hydroelectric production was 15.8 TWh with an increase of 0.9 percent over the preceding year; the thermoelectric power output was 279.8 TWh, an increase of 5.8 percent.

The hydroelectric power plants contributed 5.3 percent and the thermoelectric power plants contributed 94.7 percent to the total output; the share of nuclear power plants in recent years has been about 14.3 percent.

Letter of Intention for KKI-2

On 7 March Bayernwerk decided to send a "letter of intent" to KWU [Power Plant Union], pertaining to the purchase of a second unit for the KKI power plant. KWU was charged with planning a second unit back in 1978; this 1,300-MWe unit was to be built next to the first one. The construction permit was applied for in February 1979.

The new plant is scheduled to go into operation in 1987-1988.

Third Partial Construction Permit for Gundremmingen 2

At the end of January, the Ministry of Development and Environment of Bavaria issued the third partial construction permit for the KRB-2 power plant in Gundremmingen.

This plant, made up of two BWR units, with 1,244 MWe net, should be operational by the end of 1982 with the first one and by the middle of 1983 with the second one.

East Germany

Nord 4 in Operation

The fourth unit of the Nord-Bruno Leuschner power plant at Greifswald became operational last November, as was learned recently from press reports. Like the earlier three units, it has a gross output capacity of 440 MWe and is equipped with the Soviet VVER reactor.

The first reactor has been in operation since 1974; the second one has been operating since the same year and the third one was started up in November 1977.

According to the national energy program, the power plant will be expanded in order to include another four units, likewise with 440 MW each (see NOTIZIARIO 24, 20-21 November 1976). According to press reports, the work on these new reactors has already been started.

Another new power plant is planned for a site 25 km from Stendhal on the Elbe.

Nuclear energy currently supplies 11 percent of the country's electric output.

The first power plant, the one at Rheinsberg, in service since 8 May 1966, has been turned into a personnel training center; for this purpose, the center was also equipped with a nuclear power plant simulator in 1975.

Agreement with USSR for Construction of Stendhal Nuclear Power Plant

The nuclear cooperation agreement signed in East Berlin on 10 April with the USSR involves the construction of the country's third nuclear power plant at Stendhal, about 100 km from Berlin.

Japan

Uranium Prospecting in the United States.

A consortium of Japanese companies made up of electric enterprises, commercial outfits, and mining companies, is planning to conduct a uranium prospecting program in the Noserock area in New Mexico, United States. The prospecting starting date depends on the result of the negotiations which the consortium is conducting with Phillips Uranium Co., of the United States, the owner of the Noserock mining concessions.

Experimental Program for Dumping Nuclear Waste in Ocean

A one-year experimental program is to be started in June 1981, concerning the dumping of low-radiation waste, embedded in concrete, in the northern Pacific Ocean, about 800 km southeast of Tokyo.

This will be followed by experiment evaluation which will take 2 or 3 years, prior to further action. The dumping will be accomplished under the direction of the Science and Technology Agency and the Tokyo Radioactive Waste Management Center.

The radioactivity figure will be less than 100 Ci/t of waste and in future experiments it will be at most 1/500 of that figure.

The JAERI is conducting experiments with subjecting waste to simulated pressure at a depth of 5,000 m, while the Central Research Institute of the Electric Power Industry is simulating ocean bottoms at a depth of 7,000 m.

Great Britain

Confirmation of Decision to Build Two ACR Power Plants at Heysham and Torness

On 14 April, the government confirmed the decision to build two nuclear power plants of 1,320 MWe at Heysham and Torness; they will be of the AGR type (2 x 660); one of them has been planned for quite some time.

The capital cost, including the initial fuel charge, is 1.25 billion Pounds Sterling for the Heysham power plant and 1.2 billion for the Torness power plant.

These estimates do not include variations in interest rates during construction which could come to 200 million Pounds Sterling, considering a period of construction of 6 years.

The two power plants will be of the AGR type, improved in comparison to those now in operation at Hinkley Point B and Hunterston B. The main differences will arise in the blueprints for the turbine and in the better safety systems.

BNFL Plans for Possible Increase of Losses in Windscale Silo

The Nuclear Installations Inspectorate has issued instructions to BNFL for the preparation of a plan to seal off a silo in which a loss of radioactive material developed in 1972.

This loss was discovered in October 1976, following excavation work to expand the above-mentioned silo, done in reinforced concrete, where the Mg alloy sheaths are separated from the spent fuel coming from the Magnox reactors.

The instructions of the NII were contained in a report published recently by Britain's Health & Safety Executive, an agency very close to the NII.

According to the report, the NII would prefer BNFL not to carry out the plan unless there were a considerable increase in losses.

It feels that most of the radioactivity, with 50,000 Ci due primarily to Cs and Sr, has been dispersed and is safely trapped in the ground near the silo.

The current loss unit can be figured at around 1 Ci/day, in which case it could be stopped by emptying the silo.

Keeping this in mind, the NII asked the BNFL to develop methods of recovery and treatment of products contained in the silo and proceeding to the relative emptying as soon as possible.

The BNFL likewise is to develop methods for the reprocessing of Mg alloys, to complete the planning work for special mobile equipment capable of handling the earth in order to proceed to relative decontamination, as well as to identify treatment methods for the earth recovered.

No radioactivity attributable to the loss in question has so far been detected in the ground around the Windscale plants.

It is calculated that the underground water, containing nuclides, such as tritium, which is not absorbed by the ground, would require between 4 and 6 years to reach the site limit. The radiological survey after migration should be "negligible."

For components with major radioactivity, such as Cs and SR, it has been calculated that the migration speed would be, respectively, 2,000 and 500 years.

For practical purposes, this means that these elements would never reach the site since the relative decay times are measurable in some tens of years. Nevertheless, the NII reserves itself the right to conduct inspections in this connection.

Within a few meters from the loss point [leak], however, the activity levels in the ground are "considerable."

According to the report, most of the radioactivity is concentrated in a horizontal area of 7 m from the silo. The most heavily contaminated earth volume is about 130 m^3.

Government Authorizes Plutonium Transport from Windscale to Dounreay

The UKAEA will be able to complete the fuel cycle for the PFR at Dounreay, according to an announcement relating to the government's approval of the transport of the plutonium nitrate solution by sea and by land from Dounreay to Windscale.

The fuel for the PFR is produced here but is reprocessed at Dounreay, where a plant was opened for this purpose in 1979 (see NOTIZIARIO 25, 12 November 1979).

The government's decision was made following the conviction that the risks involved in the operation of shipping plutonium nitrate are "substantially lower than those usually encountered in industrial operations."

The UKAEA is planning to ship the plutonium in shielded transport containers with a maximum individual capacity of 250 liters.

The first reprocessing cycle should be started next June.

Uranium Deposits

Two uranium deposits have been identified, respectively in the states of Kelautan and Pahang, in Eastern Malaysia.

Sweden

Fuel Charge at Ringhals-4 and Forsmark-2 Authorized

The Swedish government on 10 April authorized the charging of fuel into the reactors of the nuclear power plant at Ringhals-4 and Forsmark-2.

This is the first positive result of the 23 March referendum (see NOTIZIARIO, 26 April 1980). The two units, with about 900 MTU, each, have been ready for quite some time and the start of operations here was made to depend on the outcome of the referendum.

The authorization calls for operation until the end of 1986 but could be automatically extended if a new agreement on spent fuel reprocessing and on radioactive waste dumping is worked out between SFBK, the Swedish fuel supply company, and COGEMA of France.

USSR

BN-600 Critical

According to press reports, the BN-600 fast sodium reactor at Beloyarsk was started up early in April. Fuel charging was started at the end of December (see NOTIZIARIO 26, 15 March 1980).

Oktemberyan-2 Connected to Network

The second unit of the Oktemberyan power plant, near Mezamor, in Armenia became operational on 28 December of last year.

This 440 MW reactor, like the first one, is of the VVER type; the first unit had supplied energy for the first time in December 1976.

The entry into service of this power plant came shortly after the one at Leningrad 3 (see NOTIZIARIO, 26, 14, January 1980).

Data on Nuclear Electric Energy Output and Fossil Fuel Consumption in 1979

According to data supplied by the Central Statistics Office in Moscow, the total output of petroleum in 1979 increased by 2.4 percent, compared to last year, reaching a figure of 546 million t, while the natural gas output went up 8.5 percent, reaching a figure of 407 billion m^3.

The output of nuclear electric energy came to 54 billion kwh accounting for 4.3 percent of the country's total energy output. At the end of 1979, the Leningrad nuclear power plant--whose third unit became operational on 7 December (see NOTIZIARIO, 26, 14, January 1980)--had produced a total of 60 million kwh.

Uranium Production from Moroccan Phosphates

On the basis of information supplied by OECD, the Soviet Union would like to purchase Moroccan phosphate in order to recover uranium from them as a byproduct, on the basis of the positive test conducted by United States with phosphates from Florida (see NOTIZIARIO, 26, 69-70, February 1980).

Moroccan phosphates have a uranium content of 0.015 percent or 150 g/t.

On the basis of the agreement between Morocco and the Soviet Union, the latter, in 1983-1993, is to get $55 \cdot 10^6$ t of phosphates, from which it would be possible to recover 700 t of uranium.

ENS

European Nuclear Company

In connection with the Reactor Conference, meetings were held in Berlin by the management agencies of the European Nuclear Society; the Board met on 24 March, the Steering Committee and the General Assembly met on 25 March.

In addition to Professor Carlo Salvetti, president of the European Nuclear Society, the meetings were attended by the representatives of 14 out of 15 European nuclear associations federated in the ENS, including Professor Karl Beckurts (KTG, Germany), Dr Harry Cartwright (BNES, Great Britain), engineer Pierre Zaleski (SFEN, France), engineer Francesco Fraschetti and engineer Giuseppe Basso (SNI and ANS, Italy), Dr Peter Tempus (SGK, Switzerland), Dr Manual Perello Palop (SNE, Spain). The Steering Committee approved the revenue and expenditure report as of 31 December 1979 and the budget estimate for 1980; it engaged in lengthy deliberations on the Society's future activities. Among these we might mention the organization of a big nuclear conference in Brighton, Great Britain, in April, 1983; the Second Nuclear Technology Transfer Conference, in Buenos Aires, in 1982, in cooperation with ANS and the Argentine Nuclear Society. Concerning the November 1980 Washington International Conference, organized jointly by the ANS, ENS, and AIF, the Steering Committee took note of the favorable progress of work by the various committees and decided to address invitations to all European members to send many reports to the Selection Committee by 30 June 1980 in order to guarantee European technical participation in the conference at a level not below that of the United States during the 1975 Paris conference and the 1979 Hamburg conference.

The Steering Committee finally approved some organizational changes in the ENS upon proposal of the Planning Committee which was chaired by Dr Gordon Brown in order to develop activities and pursue statutory objectives in support of the members.

The Program Committee of the ENS likewise met in Berlin. It was chaired by Dr Buenemann (KTG, Germany). Italy was represented by engineer Marco Martini (ANS, Italy) and Giuseppe Basso (SNI). The Program Committee examined the favorable progress of work for some meetings organized by various national associations, for which the ENS has granted "cosponsorship" in relation to the relevant interest of the topic: Reactor Safety Aspects of Fuel Behavior, ANS-ENS, Sun Valley, 2-6 August 1981; Engineering Nuclear Systems, SGK-ENS, Lausanne, 8-11 April 1980; Fast Reactor Safety, ENS-ANS, Lyon, 1982.

Regarding especially the Sun Valley meeting, the four representatives of the ENS were designated for the mixed program committee, as follows: Dr Stephen Krawezynski (ZBB-KFA [Nuclear Research Institute] at Juelich); Dr Alberto Pedretti (CNEN, Rome); Professor Plankart (SCK-CEN, Mol); Dr C. Ringot (CEA, Fontanay aux Roses)

Preliminary approval was given to a conference to be held in 1982 in Europe on the topic "T.M.I. Aftermath" with special emphasis on training reactor operators.

Finally, after having stressed the need for establishing bodies similar to the "Divisions" of the ANS, the Program Committee decided to ask all national associations to appoint "corresponding members" for the following 12 subjects: reactor physics and fuel cycle; mathematics and computation; nuclear fuel technology; nuclear safety and radiological protection; power systems; components; instrumentation; reactor operating experience; material research and reactor chemistry; reprocessing and waste management; environmental aspects; fusion.

Program Address by Premier The Hon. Cossiga to Both Houses

On 14 April 1980, Premier Francesco Cossiga presented the administration's program to both houses.

We are reporting here the portion pertaining to the energy program.

The parties have agreed that--in view of the continuing seriousness of the petroleum supply problem--energy policy constitutes the main point in the administration's policy. It has been established that the national energy plan is to be updated and checked out periodically. Starting with an estimate of the medium-range and long-range demand, we will pursue the further reduction of the country's dependence on petroleum through conservation and efficient energy use, as well as the development of renewable and alternate sources. Regarding nuclear energy in particular, it is absolutely necessary, within the context of the limited and controlled use of this source, to complete studies and investigations on the determination of the suitability of sites for the placement of power plants, studies to be forwarded as soon as possible to the regions and the interested communities, while, parallel to this, a re-examination will be started regarding the laws and regulations dealing with the placement of nuclear power plants. It is furthermore necessary to tackle and resolve the fundamental problems relating to safety guarantees, to territorial planning for plant sites, and the conditions of participation of the regions as well as the obtention of the pertinent social consensus.

This leads to the gradual separation of safety control functions from research and development functions currently concentrated in the CNEN. This separation must be accomplished gradually and without causing any interruption in the operation of the controls themselves.

Petroleum supply, which will however remain prevalent and necessary to meeting the country's energy demand, must be pursued also through suitable government initiatives in order to establish relationships of cooperation and long-term exchange with producer countries, seeking a similar attitude among the Community and the IAEA.

Regarding methane, it is necessary to plan for an ENI initiative in cooperation with the regions for the planning and construction of networks which allow the fastest possible use of this source in the South.

A specific effort must be made for the reorganization of local energy services, especially in the companies under municipal control, for the expansion of collateral and complementary activities.

Concerning finally prices and rates, the adapation to international levels must be accompanied by safeguarding the social consumption volumes of the lowest-income earners as well as a consideration of the requirements of territorial or sector planning.

1980 Annual Nuclear Technology Conference (JK '80)

The 1980 meeting on nuclear technology (JK '80), until now known as reactor conference, was held in West Berlin between 25 and 27 March 1980.

This annual event, organized by the German Atomic Forum and the Nuclear Technology Company at the new International Congress Center in West Berlin, changed its name this year because the topics taken up year after year were becoming ever more numerous and also involved subjects not specifically connected with reactors. JK '80 was opened by KTG president Professor Dr H. W. Levi and the president of the European Nuclear Society, Professor Carlo Salvetti.

The event's program was broken down into four groups of meetings.

Plenary Meetings

These were held in the morning hours of the 3 days of the conference; they examined the nuclear energy situation from various aspects in the economic and safety context in the FRG and worldwide.

Reports were presented as follows on the first day:

Harrisburg, one year after the incident (A. Dieckamp, United States) and its consequences on research and development programs (H. Seipel, BMFT [Federal Ministry of Research and Technology]);

German study on reactor safety (A. Birkhofer, GRS) and operating practice as a means for improving reactor safety (G. Kellermann, GRS).

The following topics were taken up on the second day:

The new concept of waste removal and disposal of the West German government (W. J. Schmidt-Kuester, BMFT), after the government of the State of Lower Saxony in May 1979 declared that the Gorleben is basically feasible from the safety viewpoint but that its construction cannot be supported in the nuclear programs from the policy viewpoint. The waste removal situation was furthermore examined from the safety viewpoint (W. Schueller, GWK);

Results of the INFCE (International Nuclear Fuel Cycle Analysis Program) (Mr Popp, BMFT);

The situation in the nuclear industry (O. H. Schiele) and the economic consequences deriving from the nuclear energy situation in the FRG (R. Eberle, Minister of Economy, Baden-Wuerttemberg).

On the last day, the following reports were presented:

Ahmed Said, Director, Research Division, OPEC, Vienna, on the future of the international energy market and the possible role of fossil fuel and other forms of primary energy;

Mr Pecqueur, general administrator of the CEA, on energy in the Eighties in France and worldwide in the spirit "of not finding ourselves without any more");

P. Glotz, West Berlin science and research senator, on assuring the future through energy research;

G. Brunner, commissioner for energy, EEC, on the European energy situation in the worldwide context;

[illegible], president, German Atomic Forum on problems, tasks, and proposals of the nuclear industry to reduce dependence on petroleum imports in the FRG with the help of nuclear energy.

The other three groups of meetings were held in the afternoon; this made it impossible to keep up with all of the topics taken up which may have been of particular interest.

Meetings of Experts

These related to the following:

Operational experience with advanced reactors, such as Phenix, KNK II, AVR, as well as PWR and BWR;

Impact wave propagation processes in LWR, in the case of LOCA, etc.;

Methods of early damage detection in BWR, PWR, FBR;

Interaction between man and plant (personnel qualification, operational documentation, man as safety barrier, etc.);

Possibility of parallel use of computers in nuclear technology (combined meeting of KTG and German Physics Society).

Round-table discussion on legal regulations and risks (legal topic).

Meetings on Controversial Topics

Requirements, problems, and possibilities of the peaceful utilization of nuclear energy--current status of discussion;

23 March 1980 referendum in Sweden--a topic which was no longer controversial in view of the outcome of the voting;

Linear relationship between dose and effect in the case of small doses

Technical Meetings

Here, reports were presented during eight sessions:

Heat and fluid dynamics;

Nuclear plant safety;

Fuel cycle and safeguards;

Fuel element;

Components and quality control;

Plant construction and operation;

Fusion technology;

Reactor types;

Energy systems and economic problems (illustrated also in the poster sections).

The reports submitted during the technical meetings are compiled in the book "JK '80 Tagungsbericht."

9058
CSO: 5100

BRIEFS

HEAVY WATER ARRIVES--Jaipur, June 15. About 250 tonnes of heavy water from Russia has reached Rawat Bhatta--the site of the Rajasthan Atomic Power Project, according to a report from Kota. The second unit of RAPP would be commissioned by the end of October with a generation of 200 MW. With the commissioning of the first unit in 1973, about 210 MW was being produced, but due to frequent shut-downs, for one reason or the other, there has been a shortfall in power generation. The Rs 205-crore second unit was to have been commissioned in 1975. But this could not be possible due to non-availability of heavy water. Originally, India was to obtain heavy water from Canada. Following the Pokhran nuclear explosion Canada refused supplies, resulting in considerable delay in commissioning the second unit. [Text] [Madras THE HINDU in English 16 Jun 80 p 13]

CSO: 4220

GERMAN DEMOCRATIC REPUBLIC

INCREASED USE OF NUCLEAR ENERGY RECOMMENDED

West German Commentary

Bonn IWE-TAGESDIENST in German No 69, 6 May 80 p 3

[Report from Berlin: "GDR Science Academy Advocates Nuclear Energy." A translation of the East Berlin April 1980 SPECTRUM article cited below follows the two West German commentaries]

[Text] The GDR long-term planning to solve its energy problems provides for an above-average share of nuclear energy based on an international comparison. Since the availability of domestic brown coal is decreasing and development and mining costs are rising, the East Berlin Academy of Sciences issued the statement that the gradual replacement of this energy source by nuclear energy must be the objective of a long-term strategy, and the GDR must, because of its specific conditions, use "a higher share of nuclear energy" than other countries. Moreover, since the technically utilizable uranium deposits are likewise limited, the energy problem can be solved on a long-term basis only by fast breeders. The GDR academy does not anticipate safety problems from the massive use of nuclear energy. In existing GDR nuclear power plants "a high level of technical safety is already guaranteed" by extremely strict regulations. Their own practice also confirms the internationally-based experience that industrial nuclear energy is one of the industrial technologies which have "the least harmful effects" for operating personnel and the population.

The Academy does not expect alternative energy sources such as solar energy, heat pump use, geothermal depth energy and wind energy to provide any lasting relief from energy worries. According to estimates, all nonconventional, nonnuclear energy sources together in the GDR in the year 2000 could supply at the very most only about 1 percent of the primary energy balance (SPECTRUM No 4, 1980).

Official FRG Analysis

Bonn INFORMATIONEN in German No 10, May 80 pp 10-12

['Background' report by FRG Ministry for Innter-German Relations: "GDR Plans Increased Use of Nuclear Energy." Translations of the two East Berlin SPECTRUM articles cited below follow this analysis]

> [Text] To meet its growing energy requirements--such as exist in all industrial countries--the GDR intends in the future to make increased use of nuclear energy. This fact can be ascertained from current issues of the journal SPECTRUM published by the GDR Academy of Sciences. Accordingly, Prof Dr Gerhard Keil and Prof Dr Kurt Friedrich Alexander expressed their opinions on the "Utilization of Fossil Organic Carbons in the Present and Future" and "Basic Research on Alternative Energy Sources," respectively. Both scientists are members of the Academy of Sciences: Keil is head of the academy's research sector for chemistry and the director of the academy's Institute for Chemical Technology; Alexander is the director of the academy's Central Institute for Electron Physics and in the period 1966-1969 he was the deputy laboratory director at the Soviet Dubna Nuclear Research Center.

The point of departure for Keil and Alexander is the fact that the GDR does not have any petroleum of its own and only limited natural gas deposits. On the other hand, it does have significant brown coal resources which, of course, must be obtained under increasingly more complicated geological and hydrological conditions. The structural change in the energy industry, which is taking place worldwide, can thus be observed in the GDR in a modified form. Alexander says in this connection:

"As late as 1960 the share of solid fuels in the primary energy structure amounted to almost 97 percent. Raw brown coal amounted to more than 87 percent of that. To date these proportions have been decreasing to below 70 percent. The share of petroleum increased in this period from 2.5 percent to more than 20 percent, that of natural gas to about 8 percent, and the share of nuclear energy to about 2 percent (based on the production of electrical energy it is about 9 percent)."

Alexander then emphasizes that raw brown coal will continue to be the most important energy source up to the year 2000 and for economic reasons it will also be used increasingly for the overland heating supply.

"But since availability is decreasing and development and mining costs are increasing, the gradual replacement of this energy source by nuclear energy must be the objective of a long-term strategy, and the GDR will have to use a greater share of nuclear energy than other countries because of its specific conditions."

In this connection Keil refers to the fact that the reserves of native brown coal are, to be sure, quite large, but ultimately are limited. For various reasons it will not be possible to make any decisive increase in the amount currently being mined. "We likewise cannot count on any substantial increase in oil imports." Under these conditions Keil sees three ways of closing the gap between output and demand for usable energy and organic chemical basic materials:

1. Increasing the yield from currently available fossil carbons and intensive use of them in usable energy and primary material production;

2. Making new energy sources and carbons available;

3. Restricting energy and material consumption in all spheres of consumption.

At present three sources of fossil carbons are available in rather large quantities: brown coal, petroleum and natural gas. Their share in the GDR's energy output in 1976 was as follows: raw brown coal 65.8 percent, petroleum 20 percent and natural gas 7 percent. Hard coal accounted for the remaining 7.2 percent. Not only brown coal, but also petroleum and natural gas are used primarily for industrial energy, that means, burned in some manner or other. According to Professor Keil's statements--petroleum and natural gas, however, are basically predestined for use in the material economy. Thus, even replacing petroleum with coal should first be done with the production of electrical energy and long-distance heat. But even brown coal should find greater utilization in the material economy. Keil characterized as an important contribution in this direction the development of a new process of gasification "in which, in contrast to the one currently in normal use, two costly steps in the process are saved."

According to Keil the "petroleum epoch" will be only an historically short period in mankind's technical development. Therefore, one must see to it that coal is still available after its end:

"Even if we assume a lower development of energy consumption than thus far, starting in 1990 we must make increased use of nuclear energy!"

If one considers the probable date that brown coal reserves will be exhausted, then one must conclude "that the last large brown coal power plant will be built between 1990 and 2000. Such a power plant with an output of 1,000 MWh will consume about 1,200 tons of raw brown coal and for 30 years of operation will require a deposit of 250 million tons of brown coal. The necessary designing and initial work would have to start in this decade."

As a goal of the GDR's energy policy Alexander sees making so much nuclear energy available in the first phase that growth in energy consumption can be taken care of. He goes on to say:

"The second stage will be the gradual release of coal and petroleum by not only guaranteeing growth in supply energy by means of nuclear energy, but by releasing the customary fossil carbons from energy generation. The third stage consists in the material-economy use of the coal released; this appears to us economically especially advantageous if the efficiency of brown coal processing can be improved through the availability of nuclear process heat. Even after petroleum reserves are exhausted, coupling nuclear energy and brown coal will provide the economy with a basis by supplying energy from nuclear power and chemical elements from coal."

Alexander also advocates the view that after 1980 petroleum and natural gas will slowly relinquish their summary share in the primary energy structure:

"Since the share of coal will also continue to decline, the resulting gap can only be closed by new sources of energy. As we see it today, the main share of this can be taken over only by nuclear energy. Since the technically utilizable uranium resources are likewise limited, industrial nuclear energy based on thermal reactors is not in a position to solve the energy problem for a longer period of time. That is only possible with the use of fast breeders (SBR)."

The GDR, which as a relatively small country cannot by itself develop and introduce this new energy source, oriented itself in connection with the introduction of nuclear energy first to the use of Soviet pressurized water reactors. Only in partial sectors was it involved in actual reactor development. This orientation began with the building of the first prototype power plant with an output of 70 MW in Rheinsberg; it started operation in 1966 and now fulfills the function of an experimental and teaching power plant. According to Alexander, with the building of the Bruno Leuschner Nuclear Power Plant in Lubmin with four blocks of 440 MW each the GDR has now reached its large-scale industrial-commercial phase.

The use of the fast breeder, which can be anticipated before 2000, requires sufficient advance research in order to be able to operate this type safely and economically. The necessary studies for this have been initiated at the Central Institute for Nuclear Research of the GDR Academy of Sciences. According to Alexander, in the nuclear fuel industry sector GDR energy scientists, in the framework of international research cooperation, are making an "important contribution" to the development of nuclear energy.

In the nuclear fusion sector the point of departure is the fact "that it would be neither economically nor scientifically possible and efficient to develop a self-sufficient fusion power station. But, in individual specialized areas the GDR is in a position to make useful contributions to an international or multinational research and development program. A modest beginning has already been made. Thus, for example, the GDR Academy of Sciences is involved in the tokamak research studies using a surface analysis station which it developed itself and which is being operated on the tokamak T-10 of the Kurchatov Institute for Atomic Energy in Moscow.

In regard to [illegible] [illegible] of industrial nuclear energy, which is becoming increasingly more important for the GDR, Alexander said they would "be mastered only by efficient scientific methods and can be solved by [illegible] [illegible] [illegible] goal-oriented research work and by farsighted measures."

Alternative Energy Sources

East Berlin SPECTRUM in German Vol 11 No 4, Apr 80 pp 1-6

[Excerpt from GDR Academy of Sciences paper presented by Karl Friedrich Alexander, Academy member, at the 1979 Scientific Forum in Hamburg: "Basic Research on Alternative Energy Sources"]

[Text] The relationship between energy consumption on the one hand and economic growth, industrialization, work productivity on the other hand requires that any sufficient economic growth can only be achieved through a like expansion of the industrial energy basis of any country. Therefore, energy continues to be a world problem of the greatest importance, and the GDR must give special consideration to this problem because of its specific energy source structure and limited resources.

Thus, at the Eighth SED Party Congress, with the adoption of the program for growth, welfare and stability the logical decision was made that the expansion of the industrial energy basis is foremost among structural projects. In the period from 1970 to 1975, M14 billion investment funds were made available for this, far more than originally planned. But this decision is simultaneously linked with the unconditionally necessary demand for the most economical consumption of energy everywhere that production plants are built and operated, everywhere that fuels and electric power are consumed. This general premise was reaffirmed by the Ninth Party Congress.

From 1950 to 1960 the GDR doubled the production of electrical energy (from 19,500 GWh to 40,300 GWh) and more than doubled it again by 1965 (to 54,500 GWh); at present about 100,000 GWh are being produced. These figures illustrate an enormous economic achievement by means of which the GDR's energy program is being realized with simultaneous orientation to low and extremely economical consumption of petroleum.

In spite of these efforts, however, the problem of a long-term guarantee of the energy supply has not been definitively solved and to an increasing extent the relationship between energy availability and the availability of resources is becoming critical. Petroleum and natural gas, on an international scale at their presently achieved maxium, can meet about two-thirds of the world's energy requirements. After 1980 their summary share in the primary energy structure will slowly fall off. Since the share of coal will also continue to decline, the gap opening up can only be closed by new energy sources. As it is viewed today, only nuclear energy can take over the main share of this. Since the technically utilizable uranium resources are likewise limited, industrial nuclear energy based only on thermal reactors is not capable of solving the energy problem for a longer period of time. This is only possible with the use of fast breeders (SBR).

In contrast to other countries, the GDR in reality does not have any petroleum of its own and only limited natural gas deposits. But it does have significant resources of brown coal which, of course, must be obtained under increasingly more complicated geological and hydrological conditions. The structural change which is taking place internationally can thus be observed in the GDR in a modified form. As late as 1960 the share of solid fuels in the primary energy structure was almost 97 percent. Raw brown coal accounted for more than 87 percent of that. To date, these shares have been declining to under 70 percent. The share of petroleum increased in this period from 2.4 percent to more than 20 percent, that of natural gas to about 8 percent and the share of nuclear energy to about 2 percent (based on electrical energy production it is about 9 percent).

Up to the year 2000 raw brown coal will continue to be the most important energy source and for economic reasons will be used to an increasing extent for the overland heat supply. But since availability is decreasing and development and mining costs are increasing, the gradual replacement of this energy source by nuclear energy must be the objective of a long-term strategy, and the GDR, because of its specific conditions, will have to utilize a greater share of nuclear energy than other countries.

In this connection, the orientation is directed first toward the use of Soviet pressurized water reactors; in this the GDR is involved in actual reactor development only in partial sectors. This orientation started with the building of the first prototype power plant with an output of 70 MW in Rheinsberg; this plant started operation in 1966 and now fulfills the function of an experimental and teaching power plant. With the building of the Bruno Leuschner Nuclear Power Plant in Lubmin with four blocks of 440 MW each it has now reached its large-scale industrial-commercial phase.

Use of Nuclear Energy

Since the GDR as a relatively small country cannot by itself solve the development and introduction of nuclear energy, this objective has become a key task in the CEMA comprehensive program. For industrial energy research, which, among other things, is being carried out at the GDR Academy of Sciences on its own research reactor (since 1955), two chief tasks can be derived from this:

--the creation of the scientific-technical head start for efficient construction and safe and efficient operation of imported nuclear power plants

--participation in the development of industrial nuclear energy in CEMA in line with the key points of the CEMA comprehensive program.

In the CEMA comprehensive program work is concentrated on the pressurized water reactor and the fast sodium breeder. The following topics are being handled in the pressurized water reactor sector:

--modern methods and device systems for monitoring, controlling and regulating power reactors

--studies on fuel and absorbing elements, especially studies on after-radiation

--special studies on the chemistry of the first circuit of pressurized water reactors.

In the sodium reactor sector research is being directed at the following topics:

--development of modern calculating and measuring methods and their use for physical experiments on zero energy systems

--selected methods of monitoring the reactor and the primary circuit, especially boiling and leak detection

--control of pollutants in the sodium

--basic studies for fuel elements.

The industrial nuclear energy studies on the thermal reactor are concentrating on the 440 MW blocks of the type WWER which are being used for GDR energy production in the Bruno Leuschner Nuclear Power Plant. The first activities were done, however, at the nuclear power plant in Rheinsberg.

To an increasing extent consideration is given to the fact that the earliest possible discovery of a developing breakdown in the various components of a nuclear power plant is of great importance for its safe and economic operation. The more precisely developing breakdowns can be diagnosed early, the less probability there is of accidents occurring.

One method of technical diagnosis for the early detection of breakdowns is noise diagnostics. In contrast to conventional measuring technology, in this case the total informational content of the signals is utilized. To date extensive experiences have been collected with the application of noise analysis on the first three blocks of the Bruno Leuschner Nuclear Power Plant. In this regard the chief area of investigation is vibrations from plant parts both within the reactor core as well as from the components of the first circuit.

The use of the fast reactor, which is to be expected before 2000, requires adequate advance research in order to be able to operate this type, too, safely and economically. In this respect, many of the investigative methods developed for thermal reactors can in principle also be used for the fast breeder. However, there are also special problems which must be dealt with separately.

A "fast inset" was developed and built at the Central Institute for Nuclear Research of the Academy of Sciences to test calculating methods for the fast breeder and to correct data. In this, a part of a fast lattice is put into a ring-shaped exciter zone. In close interplay between theory and experiment for various spectra, purposeful studies to check computer programs were implemented with this system

Advance research on the technical diagnostics of the fast breeder primarily concerns the problems of liquid-metal cooling. For this, in the Central Institute for Nuclear Research, studies were made of the initial boiling point in the heat carrier sodium as well as studies of the earliest possible detection of developing leaks in the steam generators.

In the framework of international research cooperation the institute is also making an important contribution to the development of industrial nuclear energy in the sector for nuclear fuel management. Problems of the fuel cycle and of the performance behavior of fuel and absorbing elements are being studied.

Studies Relating to Problems of Nuclear Fusion

An additional area of basic research on alternative energy sources, which opens up great prospects for the energy supply in the next century, is mastery of controlled thermonuclear fusion. As is known, in the past few years work on nuclear fusion has been strongly advanced internationally, and it is assumed that in the course of the 1980's the first demonstration experiments of an energy-producing fusion reaction (scientific break even) will succeed. It is thought that the first demonstration experimental power plants will go into operation in the 1990's.

In general, among scientists the conviction is growing stronger that, following subsequent additional technological development, nuclear fusion power plants can become an important and essential component of a mature nuclear power industry.

As in the case of nuclear fission energetics, our research strategy in this sector is based on the fact that for the GDR it would be neither economically nor scientifically possible and efficient to develop a self-sufficient nuclear fusion program. But in individual specialized sectors the GDR is in a position to make useful contributions to an internationally coordinated research and development program. A modest start has already been made in this. Thus, for example, the GDR Academy of Sciences is participating in the research studies on tokamak using a surface analysis station which it developed itself and which is being operated on the tokamak T-10 of the Kurchatov Institute for Atomic Energy in Moscow.

As existing experiences show, nuclear fusion research is suited, to a special degree, for international cooperation. Such a program of cooperation is currently being prepared for tokamak development in the framework of CEMA with active participation by the GDR. We view the INTOR project, which was first suggested by the USSR and was borne by the International Atomic Energy Agency, as an even larger, very progressive initiative; this project is to unite all nations that lead in nuclear fusion research in the building of a demonstration-experimental power plant following the tokamak principle.

Nonfossil and Nonnuclear Energy Sources

In the quest for alternative energy sources as substitutes for fossil energy sources, nonconventional and nonnuclear energy sources are also being studied in respect to possible use and productiveness. Of the energy resources which are being discussed internationally only some are of interest for the GDR because of its geographical and geological conditions:

--solar energy

--heat from earthquakes, ground water, surface water and the atmosphere, with the use of heat pumps

--geothermal depth energy

--wind energy.

With the exception of wind energy, on the basis of currently possible technical solutions all energy resources mentioned are economically suitable only for making available low-temperature heat, given conditions in the GDR.

In addition to the "passive" utilization of solar energy, the promising method is the use of low-temperature collectors in order to make available heat in the temperature range up to 80°C. Thus, the development of the "classical" flat plate-collector was promoted as the most favorable solution for the use of solar energy given the GDR's meteorological conditions.

The primary areas of application in the GDR for which solar collectors are being developed can be found where rather large quantities of hot water in the low-temperature range are necessary and there is no possibility of hooking up with an overland heat supply.

As far as natural energy resources are concerned, primarily surface and ground water and earth heat are suitable as a source of heat for heat pump plants and only the latter can make them usable because of their low temperature level.

Assessments show that for private homes and decentralized residential areas (200 dwelling units) the use of heat pump plants is advantageous in meeting the heat requirements for space heating and heating water, in so far as it is not possible to hook up with an overland heat supply system using raw brown coal.

Since no tectonic zones with hot water or steam reservoirs exist in the territory of the GDR, only the geothermal energy resources appropriate to the geothermal gradient can be used. For this reason, the twin-bore method is suitable for utilizing geothermal energy; the method is being tested, but no practical experiences based on actual consumption are available.

In the wind energy utilization sector, to date no studies have been carried out. Gross estimates show that, for example, in the coastal region a "practical potential" of 200 to 400 MW could be developed with wind generators; however, evidence concerning their economy cannot yet be demonstrated. Undoubtedly further research is necessary in this sector in order thus to open up a possible, but relatively unimportant energy reserve.

In all, it is estimated that all nonconventional, nonnuclear energy sources together in the GDR can supply only about one percent of the GDR primary energy balance in the year 2000.

Nuclear Energy and Safety

As was shown, the long-term development of the GDR's industrial energy basis can basically be supported only on the options of coal and nuclear energy, in which respect a rapidly growing share is accruing to nuclear energy. As far as the safety problems of industrial nuclear energy are concerned, in the view of the GDR they can only be evaluated by efficient scientific methods and can be solved by political decisions based on the former, by goal-directed research efforts and by technical measures.

In our opinion political, technical and individual-human aspects in their comprehensive interaction must be considered for a satisfactory solution to the safety problem. From the outset, the GDR has been a participant in the nuclear weapons nonproliferation treaty and has accordingly assigned to the control of the International Atomic Energy Agency all nuclear technical activities which are subject to the determinations of this treaty.

Favorable conditions are guaranteed by the fact that the plants of industrial nuclear energy in the GDR, like all production means, are state-owned, and thus removed from the influence of conflicting interests. An independent state institution, the State Office for Atomic Security and Radiation Prevention, supervises the strictest observance of all safety regulations which were established in line with international experiences and recommendations.

These measures are already guaranteeing a high measure of technical safety. Our own practice confirms what has also been experienced worldwide, that industrial nuclear energy, especially whatever concerns its specific nuclear aspects, is among the industrial technologies which have the lowest harmful effects for the operating personnel and the population. Nonetheless, since the possible potential for danger is high, enormous efforts in research and development are still necessary in order to further limit the technical safety risks.

Finally, in the process of guaranteeing the safety of nuclear technical plants the human factor must not be neglected in the face of purely technical measures. This includes primarily a comprehensive system of training workers employed in such plants. For this purpose special sections, among other things, were created at the Zittau Advanced School for Engineering and the Dresden Technical University, which have also been equipped for a short while with their own teaching and research reactors. The teaching and experimental power plant in Rheinsberg with the nuclear power plant school located there offers in addition excellent opportunities for training.

Since the decisive safety risk comes from military use of nuclear energy, striving for safety must concentrate primarily on eliminating these dangers. Thus, accelerating the use of nuclear energy to improve the welfare of nations is permanently linked with the struggle for checking the nuclear arms race, up to the ultimate banning of nuclear weapons from the arms arsenals, even if the path leading to that is long and hard. As is known, the GDR advocates the prohibition of the use and production of nuclear weapons and their destruction. It especially supports the demand for guarantees of the nonuse of nuclear weapons. At the same time it opposes dangers which are linked with the production and stationing of new nuclear weapons carriers. The problems associated with the questions of safety of nuclear energy are precisely the ones which are especially suited for broad international cooperation which is fruitful for the general good. This concerns not only specialized scientific questions, but in like measure the spreading political problems which in precisely this instance are of special relevance for the further implementation of the policy of peaceful coexistence between countries of different social orders.

FOSSIL FUEL SITUATION

East Berlin SPEKTRUM in German Vol 11 No 3, Mar 80 pp 2-5

[Lecture, condensed for SPEKTRUM publication, by Gerhard Keil, member, GDR Academy of Sciences; head, Chemical Research Program; director, Institute for Chemical Technology; given at academy plenary session, 24 January 1980: "Utilization of Fossil Organic Carbons in the Present and Future"]

[Text] In our economy at present fossil carbons have greater importance than other groups of raw materials. Coal, petroleum and natural gas are the source of both usable energy and also of chemical basic materials. From coal and petroleum we can alternatively produce usable energy, such as electrical energy, heat and long-distance gas, but also acetylene, olefins or aromatics and other chemical basic materials. Thus, numerous problems of energy and material management come together in this group of raw materials.

Since for reasons of energy and material management fossil carbons occupy a key position in the economy, we are dealing with questions of the highest social level. Thus, it appears inappropriate to want to treat them, say, exclusively from the point of view of technological or process engineering aspects.

The reserves of domestic brown coal are quite large, but ultimately are still limited. The cost of mining is rapidly rising. For various reasons we will not be able to decisively increase the present mining output. Likewise we cannot figure on any substantial increase in oil imports. Among these conditions we see three ways to close the gap between output and demand for usable energy and organic chemical basic materials:

1. Increasing the yield from presently available fossil carbons and more intensive utilization of them in producing usable energy and basic materials

2. Making new energy sources and carbons available

3. Restricting consumption of energy and materials in all spheres of consumption.

At present three fossil carbons are available in rather large quantities: brown coal, petroleum and natural gas. The diagram on p 4 [not published] shows their share in GDR energy consumption. Thus, it can be said that not only brown coal, but also petroleum and natural gas are used primarily for industrial energy, that means, that they are burned in some way or other. From this the general statement may be derived that the efficient conversion of energy and use of energy must be the focal point, if the best possible use of fossil carbons is the issue. We are of the opinion that this is possible by optimal distribution of the fossil carbons to the specific processing methods, increasing the material and industrial energy efficiency of the methods, and better use of the resulting products.

As is known, brown coal, petroleum and natural gas differ substantially from one another in their proportion of hydrogen and carbon. This has a great influence on the technical conditions and thus on the efficiency of material-economic processing.

The organic compounds of the brown coal generally have a smaller amount of hydrogen than the necessary chemical basic materials. Therefore, hydrogen must, in most cases, be added in the material-economy use of coal. There are proven process engineering solutions for this. But they are all very costly in terms of energy and investment. This circumstance emphatically draws our attention to the fact that petroleum and natural gas are basically predestined for use in the material economy.

Also in respect to the energy content, the state of aggregation, the share of inorganic substances and heteroatoms, especially oxygen, there are serious differences; by the way this is also the case between the various coals. This ultimately results in the fact that petroleum and natural gas processing are superior to brown coal processing in respect to work productivity, basic assets requirements, effects on the environment, working conditions and the efficiency of the industrial energy and material economy.

From these and other considerations, the following result comes about within the meaning of our questioning (in this connection one must also keep in mind the date of the observation):

Petroleum and natural gas at present permit a substantially more efficient material economy than coal. As long as they are available with maintenance of economic efficiency, they should be used.

With direct combustion in the steam generator, brown coal can achieve comparably high efficiency, primarily in base load power plants, because it is moved directly from the strip mine to the power plants and is burned there. No costly pretreating is done, and with electrical energy and remote heat end products accumulate directly. Thus, a resubstitution of petroleum by coal should first be done in the production of electrical energy and long-distance heat.

Brown coal high-temperature carbonizing and gasification follow as the next possibilities in substituting brown coal for petroleum. These processes are multistage. Thus, they appear efficient if the resulting products can be further improved, because the additional expenditures in the preliminary stages must be compensated for by the great possible increase in utility value of the afterproducts. Ammonia, urea, methanol and long-chain hydrocarbons can be produced with synthesis gases. For example, methanol synthesis is gaining in importance in this connection and can open up new possibilities for industrial material conversion and contribute to the fuel supply.

the raw energy economy historically developed in a manner different from that of other industrial countries and stands out because of some special features. We also were involved in the shift to petroleum and natural gas utilization, yet we have maintained for ourselves extensive carbochemical production which utilizes raw materials and produce a large part of the usable energy from our brown coal. This currently simplifies for us the necessary investigations of selected coal processing methods. Of course--and this is demonstrated by the example of the reconstruction measures in the low-temperature carbonization plant in Espenhain--there can be no simple continuation of traditional coal processing. The tars from the low-temperature carbonization plant, for example, are no longer hydrogenated on a primary basis into fuels, but rather are processed into a valuable coke, which when highly refined supplements the palette of petroleum products in a meaningful and efficient manner.

A middle route, which for coal opens up a future that applies both to industrial energy and the material economy, is gasification. The development of a new gasification process in which, in contrast to the presently usual method, two costly process steps are saved, is an important contribution in this direction. Comrade Erich Honecker stressed this with good reason in his report to the 11th Plenum.

But with our observations we must not stop at a judgment, that is exclusively related to material and industrial energy, of the processes and the use of raw materials. As is known, the processing methods of petroleum/natural gas and brown coal also differ very substantially in respect to the use of basic assets. Thus, the investment costs must be given primary consideration. We support the view that chemists, process engineers, energy specialists and economists should work together in determining the complex economic efficiency of such variants and we see here a key point in joint research.

What possibilities for more intensive use of fossil carbons are now offered by improving the processing methods? Here we are dealing with levels of efficiency in industrial energy and materials. They are quite diverse and in the case of brown coal processing methods seem to point to large reserves. But the efficiency of these processes can only be improved at great cost.

For most methods of processing fossil carbons there are scientific-technical further developments. This is also true of the Fischer-Tropsch process by which a large part of fuels was produced 40-45 years ago in Germany. But today we cannot go this route or only partially so--as many other routes, too--because today in part completely different conditions and dimensions prevail than did in the initial years of these methods.

Intensification of raw material processing can, nevertheless, be done in other ways. A look at the history of brown coal processing reveals a close reciprocal relation between the specific properties of the raw material, the process engineering possibilities and the social requirements of the corresponding historical period. In this two trends can be established:

A progressive adaptation of the processes to the requirements of the user for which synthesis gas production serves as a typical example;

the broadening of the palette of products, in particular by the fact that undesirable waste products are used as useful products or even turn into end products by opening up new fields of application. Obtaining phenol from low-temperature carbonization water is an historical example of the reprocessing of a harmful substance.

There are large reserves in the deeper cracking of petroleum. Organic basic materials and fuels in four processing designs can be obtained; just atmospheric distillation of petroleum; additionally, vacuum distillation of the atmosphere residue; additionally the hydrogenating processing of distillate fractions; additionally the cracking treatment of higher boiling petroleum fractions.

Following the first design there is a technically simple and less costly separation of approximately 30-50 percent of the petroleum which can be processed into fuels and so forth. With each additional process mentioned, the petroleum is better utilized for purposes of the material economy until ultimately the cracking treatment makes even the last liquid components available for the material economy and coke is left as a solid residue. Each of these process stages, however, is also associated with losses in efficiency and rising investment costs. We know that there are significant reserves in the optimal use of these raw materials and the intensification of their processing. But it must also be equally clear to us that we will not guarantee the long-term supply of a dynamically developing economy with that alone.

We must not ignore the fact that after the end of the "petroleum epoch" which in terms of our current knowledge is only an historically short segment in the technical development of mankind, there must still be coal available. Even if we assume a lower development of energy consumption than so far, we must make increased use of nuclear energy after 1990.

The hard coal reserves are substantially larger than those of all other fossil carbons together, a significant part is located in the CEMA region. It is natural to want to assign to hard coal the role of future universal energy and carbon donor. However, its use for the GDR is associated with some problems, since we have no deposits of our own and the transport of hard coal is substantially more difficult than that of gaseous or liquid energy sources. Moreover, we lack the requisite processing plants. Hard coal imports would, therefore, be a considerable burden on the economic power of the GDR, and, of course, hard coal does not possess the decisive productivity advantages of petroleum and natural gas.

Here participation in investments to open up and process hard coal in the framework of CEMA is indicated, as is ordering organic basic materials which could be transported as liquid or gaseous products more easily, perhaps in the existing transport systems.

What effect will the increased use of nuclear energy have on the processing of fossil carbons? Nuclear energy would, that is in the nature of the thing, first of all take the pressure off the energy situation. If we proceed on the basis that brown coal is to displace petroleum from its industrial energy functions, two trends must of necessity later be superimposed; brown coal will replace petroleum in the production of electrical energy and long-distance heat and will even be increasingly replaced by nuclear energy. Because of that, first petroleum, but later also coal will be released for use in the material economy. When these stages will run their course depends in the first place on the rate of increase in nuclear energy production. Our first goal must be to make so much nuclear energy available that growth in energy consumption can be taken care of.

The second stage will be the gradual freeing of coal and petroleum in that nuclear energy not only will guarantee growth in usable energy, but will release process fossil carbons from energy generation. The third stage consists in the material-economy use of the coal set free; this appears to be economically especially advantageous if the efficiency of brown coal processing can be improved by making nuclear process heat available.

The coupling of nuclear energy and brown coal will provide a basis for the economy even after the petroleum reserves are exhausted by making available energy through nuclear power and chemical basic materials through coal.

If we figure backwards from the presumed date of when our brown coal reserves will be exhausted, we come to the conclusion that between 1990 and 2000 the last large brown coal power plant will be built: With an output of 1,000 MWh such a power plant uses up about 1,200 tons of raw brown coal and for 30 years of operation requires a deposit of 250 million tons of brown coal. The necessary designing and initial work would have to be started this decade. At this time, however, it must also be clear at the latest what part of the brown coal must be kept for the use of the material economy.

Restricting energy and material consumption in all spheres of consumption is a dictate of economic reason for the better utilization of available raw materials. This requires a reduction in specific consumption, changes in the economic structure and other consumption habits.

To reduce specific energy energy and material costs there are concrete targets contained in the plans for the economy; to achieve them, diverse scientific-technical measures are necessary. A look at the evidence of usefulness of energy-economy rationalization measures shows that plants for the use of waste heat, investments for thermal insulation can be substantially more efficient than measures for extensive expansion of our energy basis. Such rationalization measures are thus "relative energy producers."

An important step in saving energy and raw materials is raising the quality, longevity and reliability of the products. For example, a further development of light construction is possible with improved materials. That results in savings not only in production, but also in all subsequent transport processes, assembly and maintenance. Increasing the service life has even greater importance. It is totally clear that it cannot be exclusively a matter of reducing costs, especially the material and energy costs for production of high quality industrial products, for example, by 5 percent, but rather a question of being able to use these products not only for 5, but 20 years. In the first place this requires a different quality of products, but also other ways of thinking in individual social and productive consumption.

The throw-away ideology, which is completely logical for capitalism, is not the way for us. Instead of that, it is a matter of better acquisition and utilization of the so-called secondary raw materials. OM [expansion unknown] W. Lange, in his lecture on "Materials and Energy" showed what a favorable effect material cycles have not only in the raw material balance sheets, but also in respect to industrial energy.

Thus, it appears to us to be necessary for every producer of a material or product to be responsible in a substantially greater degree than to date not only for the quality of the product, but also to have a social responsibility for the proper use and application, respectively, of the products, and likewise for the acquisition and economically favorable further utilization when they are no longer being used. In this way, from the very outset, a good would be produced in a manner that is "supportive of recycling."

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